

CLAIMS

1. An apparatus for inspection of a cylindrical carbon article, comprising:
a yoke including first and second spaced branches;
5 a robotic arm assembly, having the yoke attached thereto, the robotic arm assembly being movable between an operating position wherein the yoke is received about the article, and a withdrawn position wherein the yoke is removed from the article; and
a pair of transducers, attached to the first and second branches of the yoke, respectively, and arranged to operatively interact with the article at
10 circumferentially spaced positions about the article when the robotic arm assembly is in its operating position.
2. The apparatus of claim 1, wherein:
15 at least one of the transducers is mounted on an extendable ram, so that the transducer can be extended toward and retracted from the article.
3. The apparatus of claim 1, wherein:
the transducers are arranged to engage the article on diametrically
20 opposite sides thereof.

4. The apparatus of claim 1, wherein:

each of the transducers is a roller transducer which is rotatable about an axis generally parallel to a length of the article.

5 5. The apparatus of claim 1, wherein:

the yoke is pivotally attached to the robotic arm assembly, and the robotic arm assembly is constructed so that the yoke pivots downward over the article when the robotic arm assembly moves to its operating position.

10 6. The apparatus of claim 1, further comprising:

a second robotic arm assembly;

a second yoke attached to the second robotic arm assembly;

a second pair of transducers attached to the second yoke; and

wherein the first and second robotic arm assemblies are master and
15 slave, respectively, constructed to move in synchronization with each other.

7. The apparatus of claim 6, wherein:

when the first and second robotic arm assemblies are in their operating positions with the first and second yokes received about the
20 electrode, the first and second yokes are spaced by a distance equal to one-

half of a length of a portion of the article which is to be inspected, so that each yoke can simultaneously traverse half of the portion of the length to be inspected.

- 5 8. An apparatus for inspection of a cylindrical carbon article having a length and a longitudinal axis parallel to the length, comprising:

an inspection station for receiving the article in a fixed longitudinal location and rotating the article about the longitudinal axis of the article while the article is in the fixed longitudinal location;

- 10 a master robot, including a first pair of transducers arranged to engage the article at circumferentially spaced positions about the article; and

- a slave robot constructed to move in synchronization with the master robot, including a second pair of transducers arranged to engage the article at a location longitudinally spaced from the first pair of transducers, so that the
15 first and second pairs of transducers may simultaneously scan first and second portions, respectively, of the length of the article.

9. The apparatus of claim 8, wherein:

- the transducers are ultrasonic transducers for measuring sound
20 velocities through the article.

10. The apparatus of claim 8, wherein:

each of the robots includes a bi-furcated yoke having two arms with one of the transducers mounted on each arm.

5 11. The apparatus of claim 8, wherein:

the inspection station includes powered rotational rollers for rotating the article about the longitudinal axis of the article.

12. The apparatus of claim 11, wherein:

10 the powered rotational rollers include first and second longitudinally spaced pairs powered rotational rollers, at least one of the pairs of powered rotational rollers being longitudinally movable to accommodate different lengths of articles.

15 13. The apparatus of claim 8, wherein:

the inspection station further includes an elevator for placing the article on the powered rotational rollers and for raising the article from the powered rotational rollers.

14. The apparatus of claim 8, further comprising:

a conveyor system having an article path in line with the longitudinal axis of the article at the inspection station.

5 15. The apparatus of claim 8, further comprising:

an encoder arranged to axially engage an end of the article for sensing a circumferential position of the article, the encoder being adjustable in elevation relative to the inspection station to accommodate different diameters of articles.

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16. A method of inspecting cylindrical carbon articles for internal physical defects, comprising:

(a) placing first and second pairs of transducers at first and second longitudinally spaced locations along a length of the article, with the transducers of each pair being spaced from each other about a circumference of the article;

(b) rotating the article about its longitudinal axis; and
(c) during step (b), providing relative longitudinal movement

between the article and the first and second pairs of transducers, so that the

first and second pairs of transducers simultaneously scan first and second portions of the length of the article.

17. The method of claim 16, wherein:

5 in step (a), the first and second pairs of transducers are carried by first and second synchronized robots.

18. The method of claim 16, further comprising:

transferring the article from an incoming conveyor onto an inspection
10 station by moving the article in a direction parallel to its length.

19. The method of claim 16, further comprising:

during steps (a) through (c), supporting the article on longitudinally
spaced pairs of powered rollers; and
15 subsequently adjusting the longitudinal spacing between the
longitudinally spaced pairs of powered rollers to accommodate a second
article of different length than the first article.

20. The method of claim 16, wherein:

in step (a), the transducers of each pair are roller transducers located on diametrically opposite sides of the article.

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